5.0
MITIGATION

CHAPTER 5.0: MITIGATION PLAN

This chapter describes the Mitigation Plan proposed by the applicant as compensation for unavoidable impacts to wetland and unvegetated estuarine bottom and open waters within Mississippi Sound as a result of the Proposed Action (Alternative 2). This plan applies to Alternative 2 and does not address mitigation for other alternatives presented in this document. However, some or all of the mitigation measures may be applicable to other alternatives. In addition, the USACE has not yet determined if the Proposed Action meets the requirements of Section 404(b)(1) of the Clean Water Act.

This chapter includes describes the Proposed Mitigation Plan and provides: (1) a detailed description of proposed mitigative measures, (2) a review of the likelihood of success and benefits of the proposed mitigative measures, (3) a description of applicable federal and state mitigation policies, agency comments, and consistency of the proposed mitigation with them, and, (4) an evaluation of potential alternative mitigative measures. Comments and recommendations provided by state and federal agencies have been considered and are discussed herein. Alternative mitigation scenarios may be developed through the consultation process.

The Mitigation Plan for the Destination Broadwater Project was proposed and developed in three parts or steps. The original plan was submitted with the Joint Permit Application for the Department of Army Permit (Baker, 1999a). The original mitigation proposal consisted of a program of on-site and off-site mitigation measures including the restoration of the existing Broadwater marina, tidal marsh creation, and breakwater habitat enhancements. The second part of the Mitigation Plan was developed in response to permit conditions for the Mississippi Department of Marine Resources Permit (Permit Application No. DMR-M-99101-Z), which required the development of stormwater treatment wetland ponds for control of non-point source runoff from the project and adjacent roadways. The third part of the proposed Mitigation Plan included the acquisition and protection of Deer Island. The Deer Island portion was developed to satisfy the State of Mississippi's conditions for obtaining the tidelands lease for the proposed Destination Broadwater Project (letter dated April 16, 1998 from E. Clark, State of Mississippi, Secretary of State, Jackson, MS, to J. Aylsworth, President Casinos, Inc., St. Louis, Missouri).

5.1 DESCRIPTION OF PROPOSED MITIGATIVE MEASURES

The elements of the proposed Mitigation Plan are summarized in Table 5.1-1 and Figures 5.1-1 through 5.1-6. The Mitigation Plan incorporates both on-site and off-site measures and includes 11.80 acres of both non-tidal and estuarine habitat creation, 15.50 acres of coastal habitat restoration or enhancement, and acquisition/preservation of approximately 400 acres of wetland and upland habitat. Detailed descriptions of mitigation measures proposed are provided in this section. Additional details of the proposed Mitigation Plan are described in Baker (1998 and 1999); these documents are incorporated here by reference.

5.1.1 On-Site Measures

On-site mitigation is proposed to provide, at the project site, compensation for impacts to non-tidal wetlands and partial compensation for impacts to open waters and unvegetated soft-bottom habitat in Mississippi Sound (Figure 5.1-1).

5.1.1.1 Restoration of Existing Marina Basin

As mitigation for the non-tidal wetland impacts and partial compensation for the area of dredging and filling of estuarine resources, a 7.4-acre area of the existing Broadwater Marina is proposed to be restored to productive shallow water and wetland habitat. Portions of the existing marina are proposed to be restored and developed into a tidal basin consisting of a 3.6-acre open-water habitat area and a 0.6-acre tidal marsh (Table 5.1-1; Figure 5.1-2). The remainder of the Broadwater Marina is proposed for conversion to a stormwater treatment pond and three constructed wetland ponds designed to filter and treat stormwater runoff from impervious surfaces of portions of the new peninsula. As noted later, federal agencies typically do not consider wetlands designed for stormwater management to count towards mitigation. Therefore, portions of the restoration of the marina basin may not be counted towards mitigation acreage.

<u>Creation of Tidal Marine Habitats (Shallow Open Water and Tidal Marsh)</u>

The existing marina is up to 10 feet deep with a mud bottom. The mud substrate would be capped with a clay layer and sandy layer above, creating a shallower basin and sealing off any potential contaminants found in the mud bottom. A tidal inlet about 1 to 6 feet in depth would be created along the western edge of the marina (Figure 5.1-2) by removing 0.7 acres of the existing Broadwater Marina wall. This inlet, combined with the shallower depths of the basin, would allow for much greater tidal flushing, alleviating the limited flushing and low dissolved oxygen problems currently occurring in the marina.

Along the southeast side of the marina, a 0.6-acre tidal marsh is proposed to be created through depth manipulation and planting of emergent vegetation (Figure 5.1-2). This tidal marsh would provide nursery habitat for estuarine fish and invertebrates (Baker, 1999). The tidal marine habitats would be created in areas not affected by shading from overhead bridge structures. The tidal marine habitats would serve a limited water quality function by polishing the water leaving the treatment wetlands described below. The tidal habitats, however, would not be cleaned or disturbed for maintenance.

Table 5.1-1
Destination Broadwater Mitigation Measures

Measure	Component	Acres
On-Site Mitigation (16.9 Acres)		
Marina Restoration	Stormwater Pond	1.60
	Non-tidal Wetlands (Constructed)	1.70
	Tidal Marsh Creation	0.60
	Shallow Open Water	3.60
	Subtotal	**7.40**
Breakwater Enhancements	Tidal Marsh Creation	1.10
	Breakwater Hard Substrate Enhancement	2.20
	Submerged Aquatic Vegetation	0.40
	Inter-tidal Sand Beach	0.20
	Shallow Open Water	5.60
	Subtotal	**9.50**
Off-Site Mitigation (410.40 Acres)		
$2.1 Million Mitigation Fund	Seagrass Planting Program	10.40
	Coastal Preserves Program (alternative plan if Seagrass Planting not effective)	N/A
	Subtotal	**10.40**
Deer Island Purchase/ Preservation (400 acres)[a]	Bayous/Ponds/Canals	11.95
	Mudflats	5.63
	Beach	47.50
	Dune Vegetation	11.89
	Salt Flats	2.03
	Tidal Marsh	200.25
	Scrub-Shrub	48.15
	Pine Forest	97.12
	Mixed Forest	39.68
	Subtotal	**400.00**
	GRAND TOTAL	**410.40**

[a] Based on MDMR Deer Island Resource Map 1999 (see Figure 5.1-6); total area of Deer Island is approximately 464 acres; 400 acres is proposed to be purchased and preserved. Actual habitat composition of purchase area will be computed when data is provided by MDMR.
Source: Baker, 1998, Baker, 1999, and staff analysis.

Constructed Wetlands

The remainder of the existing Broadwater Marina is proposed to be converted to non-tidal wetlands constructed in part to treat stormwater runoff (Figure 5.1-2). The system that would treat the first one inch of stormwater runoff from some impervious surfaces was designed in part to compensate for impacts to the non-tidal wetlands (Baker, 1999). While first-flush ponds are typically required by the state for commercial projects, construction of large retention and wetland treatment systems appears to exceed state and local requirements; therefore, portions of the constructed wetlands were designed to constitute mitigation. Although proposed as mitigation, constructed wetlands may not be considered as applicable for mitigation if designed as part of a treatment system and not considered to be jurisdictional waters of the United States.

Stormwater would enter the constructed wetland in the northeast corner of the existing marina, where an open pool (1.5 acres) with a small wetland would be created (Figures 5.1-2 and 5.1-3; see also Appendix D for description of stormwater management system). This pool would stabilize flows and increase settling of particles. Water would flow south through either weirs or pipes through the three non-tidal wetland treatment areas and finally discharge into tidal marsh and shallow open waters. The system would encourage sheet flow across the wetland for maximum treatment of the stormwater. Portions of the wetlands may be slightly brackish due to saline water intruding from underneath, but they would not be open to tides. The treatment wetland and pool were designed to be separated from the tidal waters by a system of berms. During high storm flows, water would be diverted from the pool directly into the tidal inlet, bypassing the wetlands to protect them from scour. Only the first stormwater pool would be routinely cleaned for maintenance and sediment removal.

5.1.1.2 Breakwater Enhancements

The breakwater enhancements proposed consist of 9.5 acres of habitat enhancements. These enhancements include 2.2 acres of sub-tidal jetties, offshore mounds, and other sub-tidal hard substrate features as well as sheltered coves and pockets with 0.2 acre of inter-tidal beach, 1.1 acres of tidal marsh, 0.4 acre of submerged aquatic vegetation, and 5.6 acres of shallow open water (Figures 5.1-1 and 5.1-4). These breakwater modifications, if successfully implemented, have been designed to provide a more structurally complex environment than a traditional riprap facing along the breakwater (Baker, 1998 and 1999). The pocket beaches, pools, tidal marsh, and submerged aquatic vegetation in conjunction with the hard substrate features were designed to provide greater habitat diversity and complexity to the breakwater, provide habitat for marine flora and fauna common to Mississippi Sound, and yield higher secondary production than the original deepwater sandy substrate being displaced (Baker, 1999). A discussion of the ecological benefits associated with coastal breakwaters is located in Section 5.2.

5.1.2 Off-Site Measures

Off-site mitigation elements include a $2.1 million Mitigation Fund for seagrass restoration, and the purchase and preservation of Deer Island. Should the submerged aquatic vegetation restoration fail, alternative measures would be pursued to accomplish the mitigation. These are described below.

5.1.2.1 Mitigation Fund

These funds are proposed to be used for research and restoration of submerged aquatic vegetation (SAV) in Mississippi Sound or, depending on the success of the Seagrass Planting Program, other measures associated with the MDMR Coastal Preserves Program.

<u>Summary of Agreement</u>

The Mitigation Plan includes payment in escrow to the MDMR of $2.1 million to establish a mitigation fund to be used for several possible purposes. The first priority of the mitigation fund is to support a large experimental Seagrass Planting Program in the Mississippi Sound (Moncreiff et al., 1998) to be administered by MDMR and conducted by the Gulf Coast Research Lab (GCRL). The Seagrass Planting Program element of the Mitigation Plan is part of a larger program is designed to re-establish SAV through research and restoration. This mitigation element was committed to and is described in the conditions of the Mississippi Department of Marine Resources Permit (DMR-M-99101-Z), issued by the Mississippi Commission on Marine Resources on January 19, 1999.

This plan includes the development of a seagrass restoration program as compensation for open water and non-vegetated bottom impacts. If successful, the program would restore 10.4 acres of historic SAV beds in Mississippi Sound.

<u>Submerged Aquatic Vegetation (SAV) Restoration Program</u>

The seagrass restoration program would be conducted in two phases: the evaluation phase and the establishment phase. The evaluation phase would test innovative methods of establishing seagrass. Because the restoration of SAV is experimental in nature and success cannot be guaranteed, the specific details as to the location, planting method, and success criteria would be developed as part of a cooperative program with the GCRL. Research, including experimental planting, is proposed to first be conducted to determine the feasibility of wide spread SAV restoration (Moncreiff et al., 1998).

During the evaluation phase, the location of historical seagrass beds would be reviewed and evaluated for a variety of factors to determine which sites are most suitable for restoration. Up to three sites would be selected for evaluation of planting methodologies. At each site, three one-quarter-acre plots of shoalgrass (*Halodule wrightii*) are proposed to be planted using a newly invented mechanical planter. Each plot would be planted with a combination of beach-harvested potted plants and either plugs or bare root plants collected from donor sites. The plots would also test the use of nutrients and growth additives. The sites would be monitored for a minimum of three years after planting to determine which planting treatment is most effective. Based on the completion of the evaluation phase, the most cost-effective method that provides the greatest restoration success would be identified.

During the establishment phase, the most successful planting method would be used to restore 10.4 acres of shoalgrass. The restoration method with the highest chance of success would be selected. The site would be monitored to evaluate the effectiveness of large-scale restoration.

Seagrass restoration was proposed to be a more direct method of mitigating for loss of open water and unvegetated bottom habitat (Baker, 1998 and 1999). Seagrass habitat value is derived from the high rates of primary production and associated detritus, the vertical structure that provides refuge from predators, the attachment substrate for epiphytic organisms, and binding of sediment (Bortone et al., 1997; Fonseca et al., 1992). A review of the likelihood for success of this measure is discussed in Section 5.2.

Alternative Use of Mitigation Fund Monies

If monitoring shows that the survival rate of the seagrass planting is less than the minimum set forth in the seagrass planting program criteria, the remaining funds programmed for SAV restoration by MDMR are proposed to be used to further the goals of the Coastal Preserves Program (MDMR, 1999). Selection of alternative acquisition or restoration measures would be based upon joint consultation between state and federal resource agencies.

5.1.2.2 Deer Island Acquisition and Preservation

Description of Deer Island

Deer Island is a coastal barrier island located in the Mississippi Sound approximately 0.25 miles south of the city of Biloxi (Figure 5.1-5). The island is 3.9 miles long and 1,730 feet wide at its widest point (Brown and Mitchell, Inc., 1999a). The elevation of Deer Island ranges from approximately 10 feet NGVD on the upland ridges in the west/central portion of the island to an elevation of less than 1 foot in the tidal marshes on the eastern end of the island. The island supports a rich diversity of upland and estuarine plant and animal communities and serves as a stopping point for neo-tropical migratory birds. Over 250 acres of wetlands, including the Grand Bayou estuary system, occur on the island (Morgan, 1998).

The 464-acre island is composed of numerous ecological communities including bayous/ponds/ canals, mudflats, salt flats, tidal marshes, scrub-shrub, low and high pine forest, and mixed forest (Figure 5.1-6). Acreage of ecological communities occurring on the island is listed in Table 5.1-1. The habitat composition of the 400-acre proposed purchase areas is estimated in Table 5.1-1, but cannot be more accurately computed until the MDMR provides the resource map in digital format.

A Phase 1 Environmental Site Assessment was conducted on the subject property to determine the presence of any visible signs or indications of environmental conditions that may represent a significant environmental problem that may affect future use of the property (Brown and Mitchell Inc., 1999a). The assessment concluded that the environmental conditions at the site represent a low environmental risk (Brown and Mitchell, Inc., 1999a). Brown and Mitchell (1999a) noted that a water well and two empty 55-gallon drums observed on the island should be addressed.

Deer Island has been developed and used primarily for residential and recreational purposes for over 100 years (Morgan, 1998). National Ocean Survey (formerly the U.S. Coast and Geodetic Survey) coastline maps from the 1800s indicate that several small residential type structures and boat docks once existed on the island. From 1900 to 1920 some limited residential use continued, and a small amusement park and house were constructed on the island (Morgan, 1998). These structures were destroyed by hurricanes. Although there were several plans to expand and develop the island between 1940 and 1980, no large-scale land development has occurred (Morgan, 1998). One of the more recent attempts to develop the island occurred in the 1980s, when five resort condominium units were constructed on pilings. These buildings were never occupied, and only one unit remains at the present time.

Although Deer Island has been developed for recreational and residential uses over the years, there is very little evidence of any significant site improvements (Morgan, 1998). Most of the historic site improvements, including unpaved roadways and pedestrian paths, beach pavilions, bath houses, piers, and residential structures, have either deteriorated or been destroyed by hurricanes and wildfires. Over the last 150 years, the land area has been reduced from 765 acres in 1850 to 446 acres in 1997 due in large part to extensive erosion from frequent storms (Morgan, 1998).

The most recent planned development for the island includes a $2 billion casino resort to be built on 150 acres (Deer Island Resort; Deer Island Resort LLC, undated; Morgan, 1998). Plans include three casinos, three 1,000-room hotels with parking garages, and 1,000 condominium units. In the Deer Island Resort proposed development, the island would be connected to the mainland by a new four-lane bridge. Of the 464 acres, 300 would be protected wetlands, beaches, and sand dunes. However, these beaches would not necessarily be publicly available or managed in an acceptable manner.

The Future Land Use Map in the *Biloxi Comprehensive Plan* identifies the land use as:

Waterfront Commercial = 304.66 acres
Parks and Recreation =74.69 acres
Undeveloped Land = 115.38 acres

This future land use designation is a 20-year projection for probable uses on the island and is not based upon a specific development plan for the island (personal communication, E. Shambra, Planner, City of Biloxi, and Robert LeBeau, EDAW, Atlanta, April 11, 2000). Although the present zoning designation on Deer Island (A-1) restricts further development for purposes other than agricultural-related uses (City of Biloxi, Biloxi Zoning Ordinance), the zoning may be changed if the property owner can justify the proposed change. With the numerous past development proposals and Future Land Use designation of Waterfront Commercial, there appears to be development potential for Deer Island.

Terms of Agreement

To ensure the protection of Deer Island and its rich ecological attributes (Morgan, 1998; Figure 5.1-6), the applicant has proposed to purchase the privately held land on the island currently owned by R. David Sanders, which includes approximately 400 acres (Figure 5.1-5). The remaining 60 acres of Deer Island are not part of this agreement. The Biloxi Port Commission and the Bridge and Park Commission own the parcels on the northwest part of the island, while the remaining parcels are in private ownership. President Casino, Inc. has a signed purchase agreement for those parcels owned by Sanders that would be activated once all permits, licenses, certifications, and leases for development of Destination Broadwater (Proposed Action - Alternative 2) are obtained. A summary of these terms and conditions are provided below.

> *"President Casinos, Inc., ("President") entered into separate Agreements on March 30, 1999, with State of Mississippi (the "State") and R. David Sanders, Jr., Stockholders' Agent for Robert David Sanders, Jr., James W. Sanders, Julia Sheila Sanders (formerly Sheila Sanders Lively) and June Sanders Clement, the former Stockholders of Aponaug Development Company, a Mississippi corporation, property owners ("Sanders"). The two Agreements relate to the acquisition of Sanders' Deer Island property (the "Property") by the State from Sanders; President is providing the consideration for the Property from Sanders, although the Property will be conveyed directly by deed from Sanders to the State.*
>
> *The Property will be acquired by President to be conveyed to the State to satisfy one of the State's conditions for entering into a tidelands lease for President's Destination Broadwater Project in Biloxi, Mississippi. This condition requires President to provide to the State the resources to acquire assets of major significance for Mississippi's Public Trust Tidelands. This condition was set forth in the April 6, 1998 letter from Eric Clark, Secretary of State of Mississippi, to President. President will be acquiring the Property for the State to enhance the conservation and preservation objectives of the Mississippi Public Trust for Tidelands and to mitigate the impacts of President's Destination Broadwater Project."*

The Agreement with the State is contingent upon President obtaining all federal, state, and local permits, licenses, approvals and certificates required for President's Destination Broadwater Project, referred to herein as Alternative 2, the Proposed Action. Once the Terms of Agreement are met, the property would be transferred to the state. The State of Mississippi may include Deer Island into its Coastal Preserves Program, but that remains uncertain.

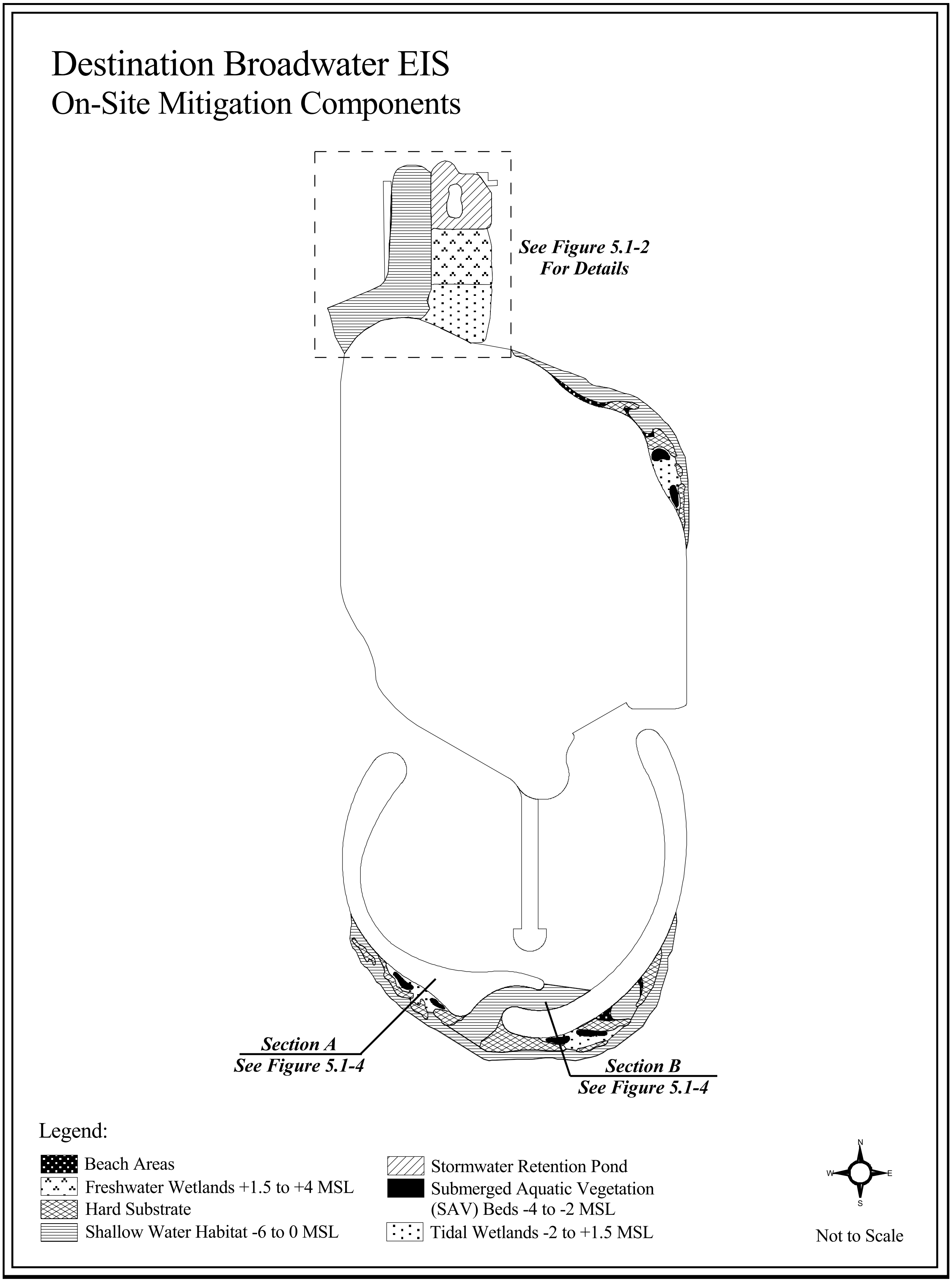

Figure 5.1-1: On-site mitigation components (Source: Baker, 1999a)

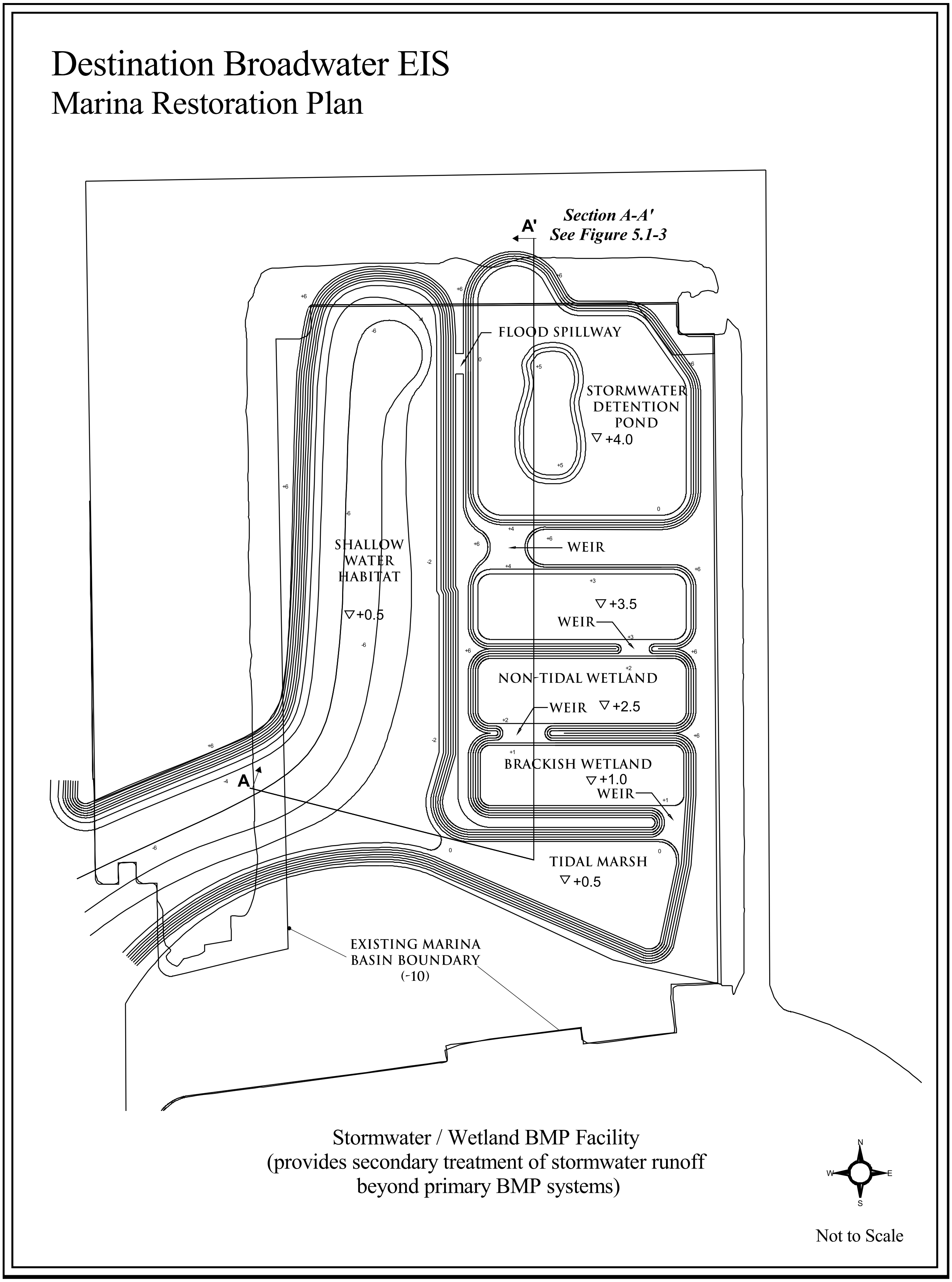

Figure 5.1-2: Broadwater marina restoration plan (Source: Baker, 1999a)

Destination Broadwater EIS

Marina Restoration Plan Cross-Section A-A'

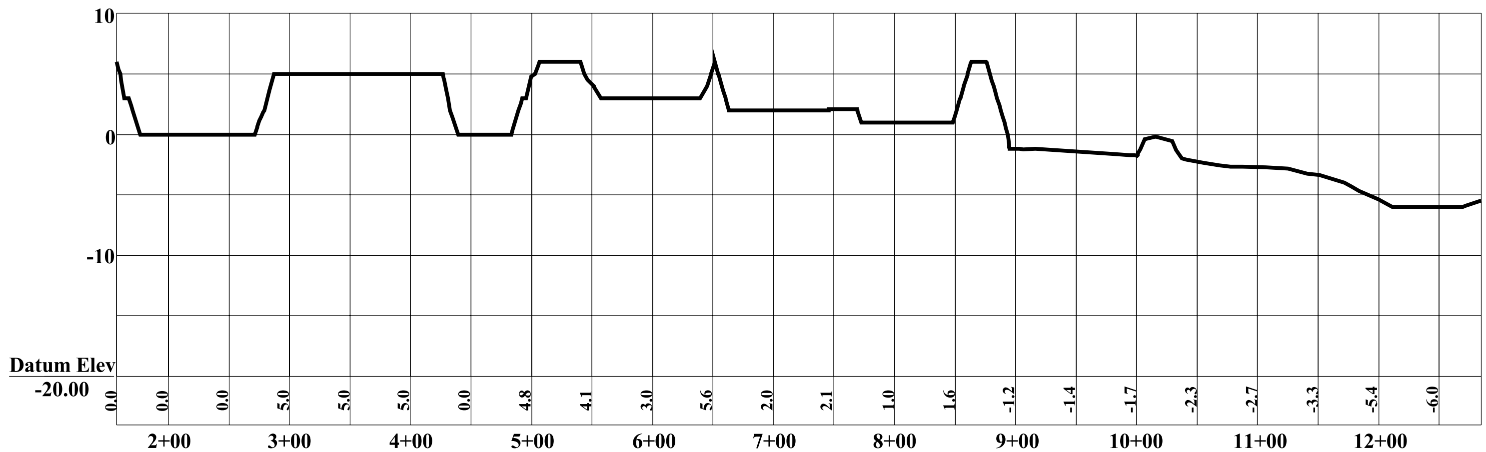

Figure 5.1-3: Broadwater marina resotration plan cross-section A-A' (Source: Baker, 1999a)

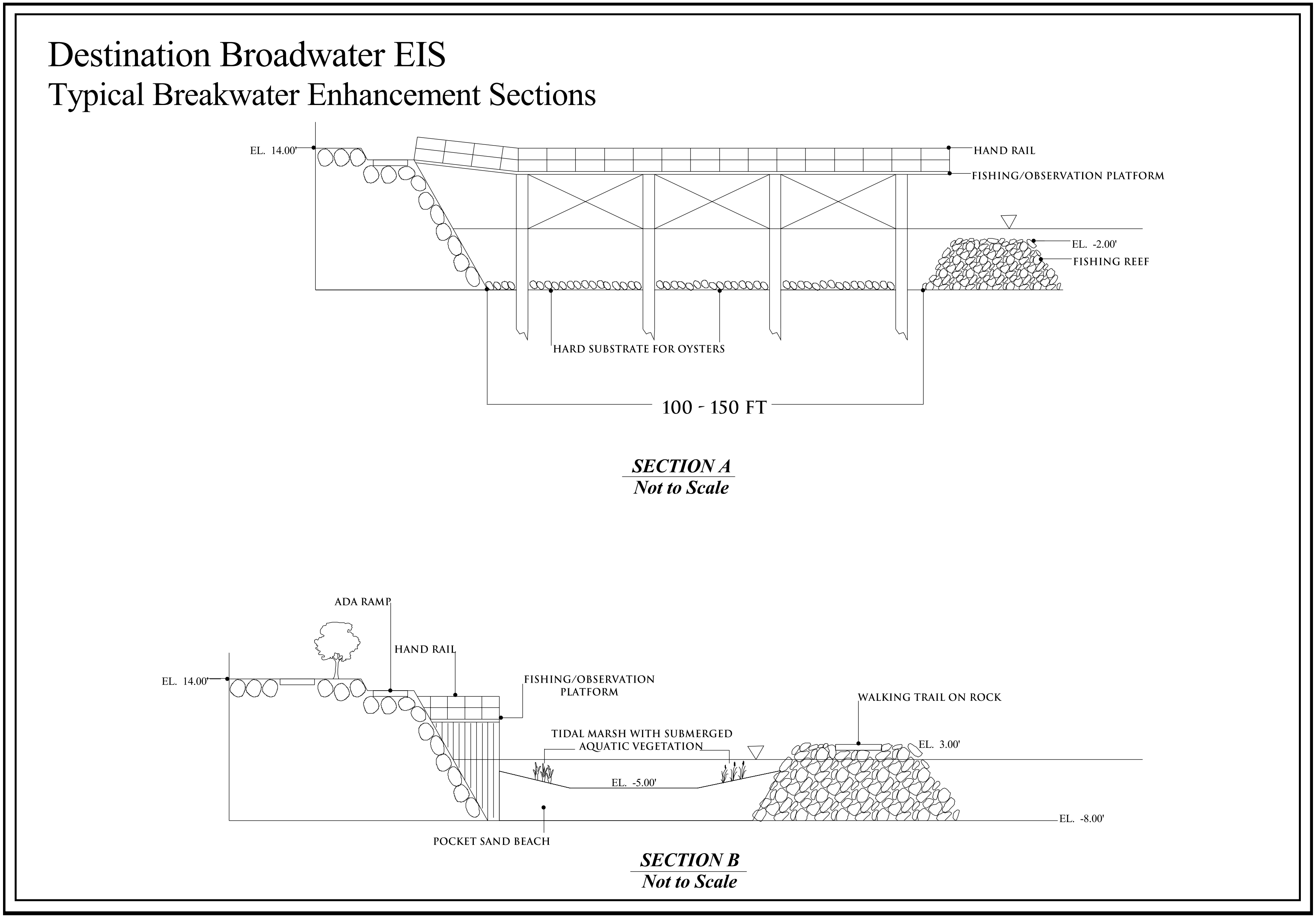

Figure 5.1-4: Typical breakwater enhancement sections

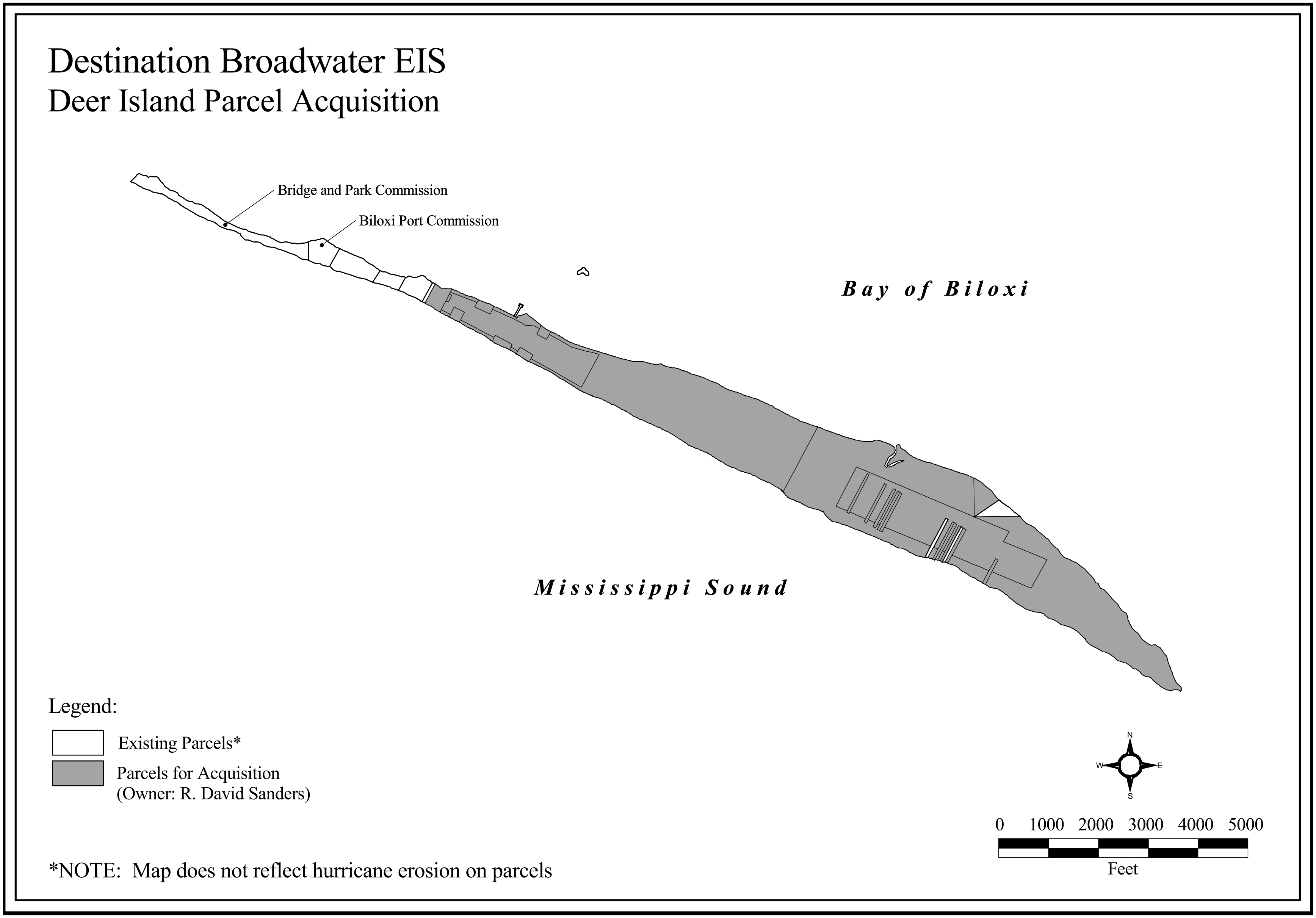

Figure 5.1-5: Deer Island parcel acquisition

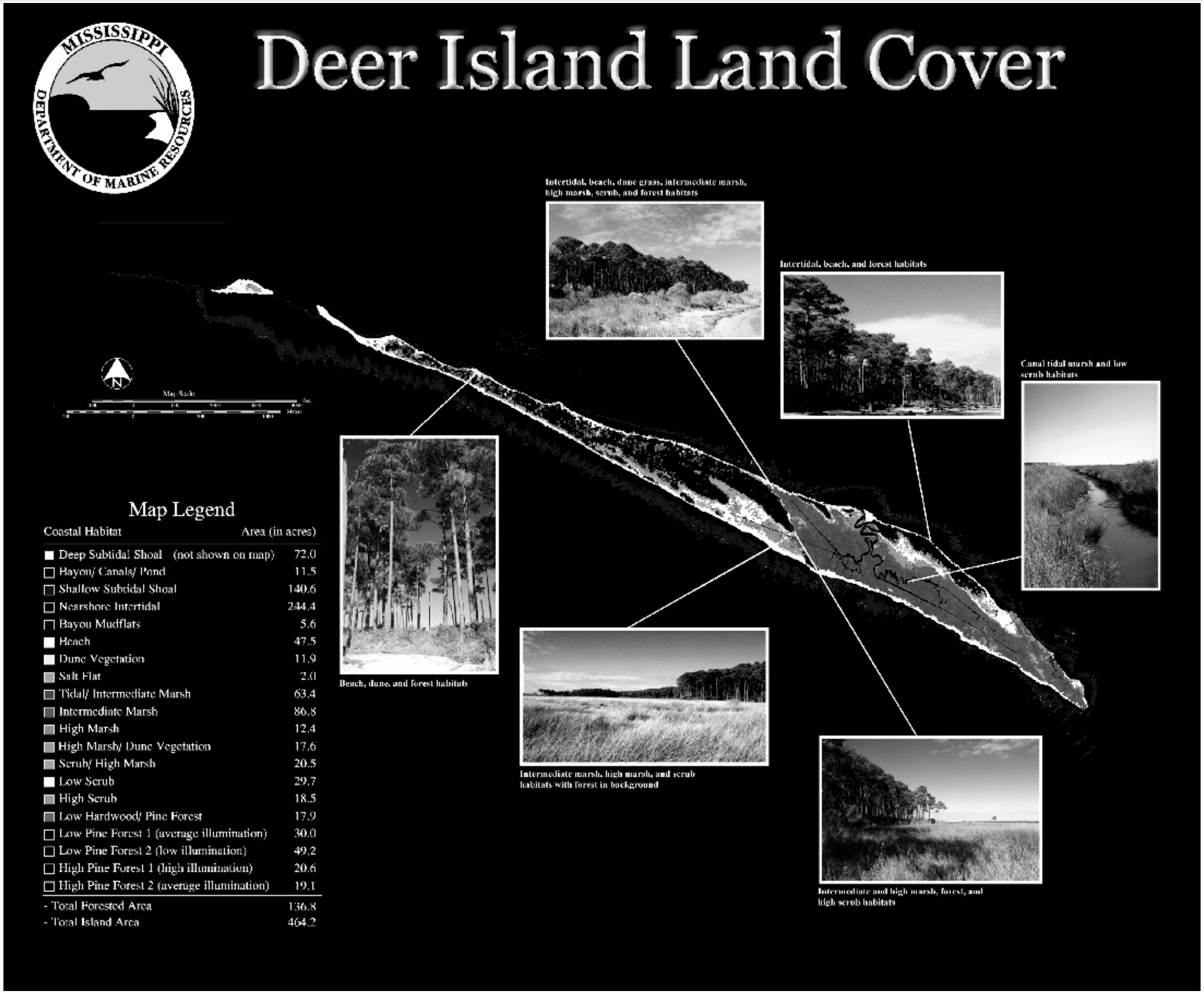

Figure 5.1-6: Biotic communities of Deer Island (Note: map received as non-editable color image file, reproduced here in black and white.)

Mitigation requirements for EFH impacts, associated with proposed dredging of channels and the marina basin, are difficult to define. While these areas would see a temporary loss of benthic production, all the affected areas would see rapid recruitment of the benthic community, followed by fish utilization of the habitat. All of these dredged areas would continue to be shallow water habitat (i.e., less than or equal to 4 meters in depth; Reilly et. al., 1999), provide food chain support, and act as functional EFH habitat, including the marina basin and entrance channels. It is expected that the proposed marina basin would likewise provide fishery habitat. Based on studies in other geographic regions (Holmes et al., 1984; Cardwell and Koone, 1981; USACE, 1996), it is anticipated that fish diversity and abundance would be higher in and around the project area than in other nearshore open waters due to the addition of the proposed breakwater enhancements. Therefore, mitigation may best be developed in light of this anticipated degree of impacts on EFH. It is recognized, however, that the addition of these features would result in the loss of natural Sound bottom and the important biological attributes it provides. Acquisition and preservation of Deer Island as mitigation for dredging impacts is non-traditional; however, the benefits, both direct and indirect, to Mississippi Sound in the long-term may be considerable.

A review of the likelihood for success and evaluation of the benefits of each proposed mitigation treatment is discussed below.

5.2.1 On-Site Mitigation

<u>Tidal Marsh Creation</u>

Tidal wetlands are typically mitigated through direct replacement of lost acreage, generally at a 1-2:1 ratio for creation, 2-5:1 for restoration and 10-20:1 for acquisition of environmentally sensitive lands, including tidal marsh. Creation of saltmarsh from uplands is generally the most commonly accepted means of replacement by the USFWS and NMFS. Based on agency comments to-date, tidal wetland creation and restoration can also serve to mitigate for the loss of non-vegetated bottom and open water habitat.

Tidal marsh creation has proven successful throughout the eastern and Gulf coastal states and is an accepted form of mitigation for functional replacement of essential fish habitat by federal agencies (Broome 1990, USACE, 1996). Tidal marsh provides a myriad of ecological benefits, including the source of primary production for a high percentage of sports and commercially important EFH species. The role of tidal marshes as nursery habitat is well documented (Thayer et al., 1981). Approximately 48 percent of the 103 species of finfish and shellfish that make up the majority of the commercial fisheries, and 45 percent of the 60 recreationally important finfish species in the northeastern Gulf of Mexico, are estuarine dependent (Thayer et al., 1981; Subrahmanyum and Drake, 1975; Kruczynski, 1982). Finfish species such as spot (*Leostomus xanthurus*), brown shrimp (*Penaeus aztecus*), and blue crabs inhabit subtidal areas during low tide and during rising tides seek shelter from predators and food within tidal marshes

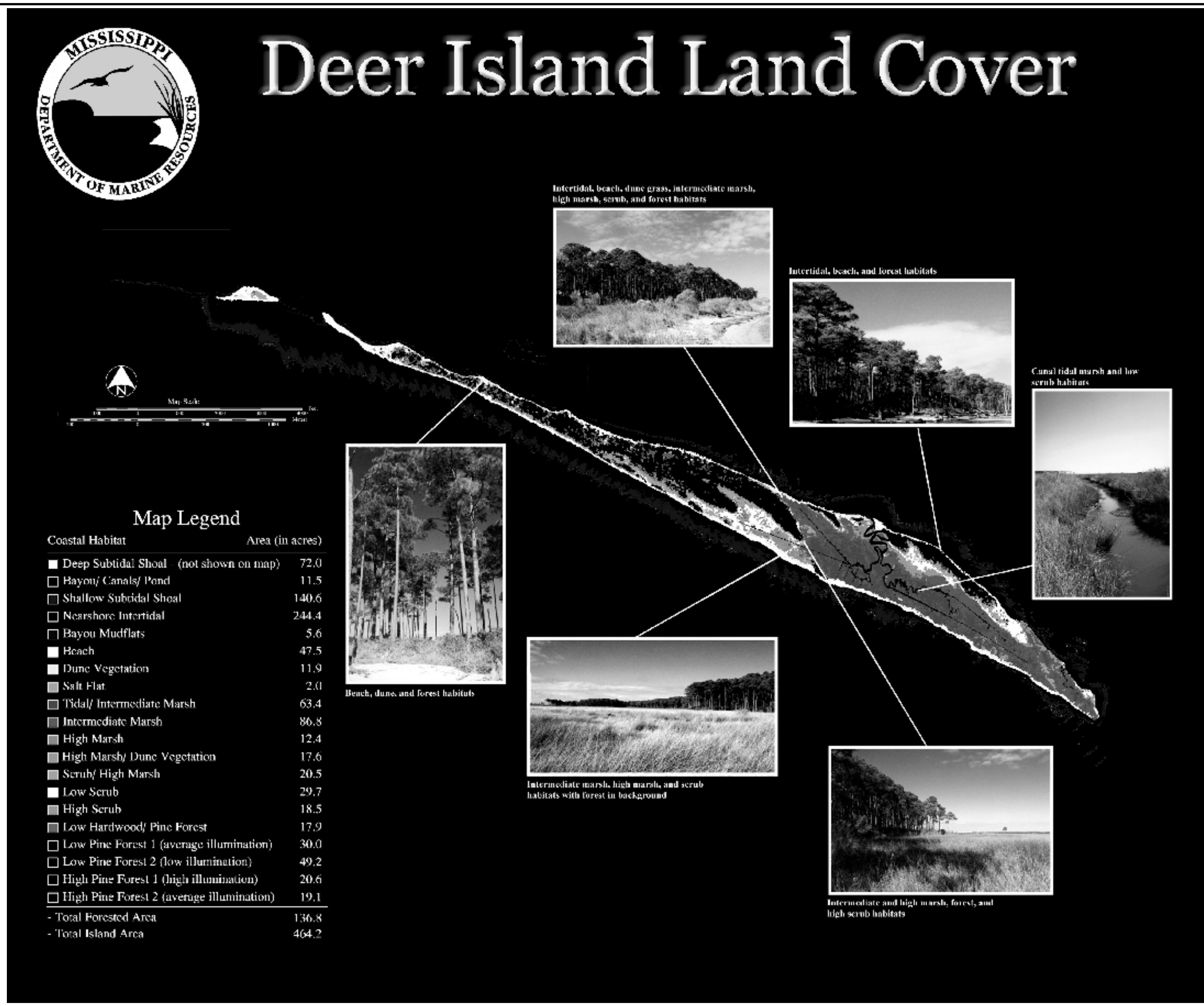

Figure 5.1-6: Biotic communities of Deer Island (Note: map received as non-editable color image file, reproduced here in black and white.)

5.2 *EFFECTIVENESS OF PROPOSED MITIGATION MEASURES*

The mitigation measures described in Section 5.1 are evaluated below as to their likelihood of success and their ecological benefits if successfully implemented. This assessment is based on the impacts quantified, the mitigation policies of federal agencies, opportunities for on-site mitigation, and the range of functions and values attributable to the measures proposed based on scientific evidence and professional experience.

Mitigation proposed for impacts to the freshwater, non-tidal wetlands may be effective given the isolated nature of the two small wetlands and their relative low quality as expressed by the WRAP assessment scores (Section 3.4). While the constructed freshwater wetlands may not be directly connected to contiguous waters of the U.S., it is possible that the constructed wetlands may be more viable in terms of wildlife utilization and flood storage and treatment than the affected wetlands, especially in terms of fish and wildlife utilization, water treatment, and flood attenuation. Construction of the advanced stormwater facility beyond the standards typically required by the state also provides water quality benefits to Mississippi Sound.

Mitigation for impacts to Essential Fish Habitat (EFH) should focus on the replacement of lost habitat and associated values attributed to the habitat and towards maintaining sustainable fisheries (GFMC, 1998). Since no definitive policy on mitigation is currently available on mitigating EFH impacts other than habitat conservation guidelines, development of mitigation strategies is subjective and somewhat difficult to address. Opportunities for direct replacement of similar non-vegetated habitat are extremely limited, mainly due to the lack of available uplands present on the Sound that can be excavated to create vegetated and non-vegetated bottom. Therefore, mitigation for EFH impacts may need to focus on other strategies that enhance fisheries production to ensure the sustainability of fisheries. Creation of tidal marshes and mud flats, enhancement of fisheries resources by creating oyster bars or artificial structures, restoration of SAV habitat where feasible, and preservation of environmentally sensitive waterfront land threatened by development are all viable options that can compensate for impacts to non-vegetated EFH, and these options have been used and accepted elsewhere.

While soft bottom communities are extremely important in food production and food chain support, they are not a critically limited habitat resource in Mississippi Sound. Habitat resources that are considered to be limited or threatened include seagrass and tidal marsh habitat (Moncreiff et al., 1998). Loss of these two resources over the past 50 years, along with water quality degradation, constitutes an important threat to fisheries sustainability in Mississippi Sound. Restoration, creation, enhancement, and/or preservation of these resources, along with improving water quality, will help ensure the sustainability of fisheries resources in the Sound. The addition of cover and refuge from predators, although not common the Mississippi Sound, increases fish and invertebrate diversity and production. The Mitigation Plan proposed for EFH impacts would serve to functionally enhance fisheries habitat and production in the Sound. Preservation of Deer Island would help ensure that development, and its associated potential impacts to water quality and fisheries, would not occur in the future. This would constitute long-term preservation of EFH and its functions

Mitigation requirements for EFH impacts, associated with proposed dredging of channels and the marina basin, are difficult to define. While these areas would see a temporary loss of benthic production, all the affected areas would see rapid recruitment of the benthic community, followed by fish utilization of the habitat. All of these dredged areas would continue to be shallow water habitat (i.e., less than or equal to 4 meters in depth; Reilly et. al., 1999), provide food chain support, and act as functional EFH habitat, including the marina basin and entrance channels. It is expected that the proposed marina basin would likewise provide fishery habitat. Based on studies in other geographic regions (Holmes et al., 1984; Cardwell and Koone, 1981; USACE, 1996), it is anticipated that fish diversity and abundance would be higher in and around the project area than in other nearshore open waters due to the addition of the proposed breakwater enhancements. Therefore, mitigation may best be developed in light of this anticipated degree of impacts on EFH. It is recognized, however, that the addition of these features would result in the loss of natural Sound bottom and the important biological attributes it provides. Acquisition and preservation of Deer Island as mitigation for dredging impacts is non-traditional; however, the benefits, both direct and indirect, to Mississippi Sound in the long-term may be considerable.

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Tidal wetlands are typically mitigated through direct replacement of lost acreage, generally at a 1-2:1 ratio for creation, 2-5:1 for restoration and 10-20:1 for acquisition of environmentally sensitive lands, including tidal marsh. Creation of saltmarsh from uplands is generally the most commonly accepted means of replacement by the USFWS and NMFS. Based on agency comments to-date, tidal wetland creation and restoration can also serve to mitigate for the loss of non-vegetated bottom and open water habitat.

Tidal marsh creation has proven successful throughout the eastern and Gulf coastal states and is an accepted form of mitigation for functional replacement of essential fish habitat by federal agencies (Broome 1990, USACE, 1996). Tidal marsh provides a myriad of ecological benefits, including the source of primary production for a high percentage of sports and commercially important EFH species. The role of tidal marshes as nursery habitat is well documented (Thayer et al., 1981). Approximately 48 percent of the 103 species of finfish and shellfish that make up the majority of the commercial fisheries, and 45 percent of the 60 recreationally important finfish species in the northeastern Gulf of Mexico, are estuarine dependent (Thayer et al., 1981; Subrahmanyum and Drake, 1975; Kruczynski, 1982). Finfish species such as spot (*Leostomus xanthurus*), brown shrimp (*Penaeus aztecus*), and blue crabs inhabit subtidal areas during low tide and during rising tides seek shelter from predators and food within tidal marshes (Zimmerman and Minello, 1984). As compared to unvegetated bottom, these species are positively associated with dense vegetation. The importance of emergent marsh as significant habitat to post-larval and juvenile peneid shrimp was recently documented in Mobile Bay (Howe, 1999).

Creation of tidal marsh on-site through restoration of the old marina bottom and in association with the breakwater enhancement would partially mitigate for the loss of unvegetated EFH at a minimum ratio. However, since the existing unvegetated Sound bottom being filled to create the tidal marsh does have some functional value, the functional lift would be less than if saltmarsh were created from uplands. Since tidal marsh wetlands are ecologically important to EFH-listed species, creating one acre of tidal marsh would offset more than one acre of filled unvegetated EFH. Although these areas may provide some fisheries benefits, they are not as productive and as important to fisheries production as tidal marsh (Thayer et al., 1979).

Shallow Open Water

Enhancing shallow open water of Mississippi is a viable form of mitigation for the loss of shallow open water and is considered in-kind mitigation. As defined in Section 3.17, a number of important shellfish and finfish use the water column for either part or all of their life cycle. Open water is especially important in supporting primary productivity and as habitat for plankton and migratory fish species.

Breakwater/ Hard Substrate Enhancement

As proposed in the Mitigation Plan, breakwater structures can be ecologically beneficial to inshore shellfish and finfish and adjacent soft-bottom epifauna and infauna, especially if designed and constructed as defined in the EFH habitat conservation guidelines (GFMC, 1998) and elsewhere (USACE, 1996). Recent studies on the ecological effects of marinas in Long Island Sound, Puget Sound, and British Columbia provide some insight into what may be expected in Mississippi Sound as a result of construction of the proposed marina and breakwater structure (Holmes et al., 1984, Cardwell and Koone, 1981). Seven marinas in coastal British Columbia were analyzed to determine whether the marinas studied enhanced or were detrimental to fish production (Holmes et al., 1984). Based on the results of the study, fish production was higher at marinas where adequate structure and substrate was present to support higher algal cover and a more abundant benthic community. Creating rocky shallow habitats as mitigation for the loss of shallow fish rearing habitat associated with marina construction in Puget Sound was monitored to determine the benefits provided to micro and macro-algae, epibenthic invertebrates and finfish (Cheney et. al. 1991). The monitoring study concluded that the rocky shallow mitigation habitat created provides interstitial refuge for epibenthic organisms and structure for the attachment of algae, thus replacing "in-kind" food resource production.

The breakwater enhancements would attract a wide range of fish species similar to those found on rock jetties and other artificial reef structures. Hastings (1979) identified 220 species on inshore rock jetties at Destin and Panama City, Florida. Bortone et al. (1997) identified 122 species of fish observed on or near artificial reefs, including rock jetties, in the northern Gulf of Mexico. The most abundant species found were scud, anchovies, and sardines as well as vermilion snapper, pigfish, and pinfish, which are associated with hard substrates. The most frequently occurring species included tomtate, sandbass, seabass, damselfish, and soapfish. Large predators include jacks, amberjack, and mackerel.

The breakwater enhancements would attract recreationally important fish such as the snapper, seabass, and amberjack. However, the habitat improvements are not limited to recreationally important species, since many types of small fish also are attracted to these structures. Species such as anchovies and sardines, which would be common over the sandy substrate, may also occur in high numbers around and above the breakwater enhancements. In addition to increasing diversity, the breakwater enhancement would also increase productivity. Artificial reefs (i.e., breakwater enhancements) provide refuge from predators, resulting in increased abundance and productivity for certain species (Linberg, 1997).

In nearshore environments similar to the Broadwater location, hard substrate has been used to enhance fish production and diversity. In all instances, hardbottom features were added to soft-bottom habitat with a goal of enhancing invertebrate and finfish production. Both Mississippi and Alabama have developed inshore reefs in Mississippi Sound where conditions are not unlike those present at the Broadwater site. More than 16 inshore reefs have been built along the Mississippi Sound shore, including one off the north side of Deer Island. In offshore waters of Mississippi Sound, 226 fish havens have been created (www2.datasync.com/dmr/fisheries). While these were not constructed to offset impacts to EFH, their success in enhancing fish production and diversity is well known (D'Itri, 1985).

Alabama's Artificial Reef Program, the largest artificial reef program in the United States at the present time, is the product of a cooperative agreement between the USACE and the Marine Resources Division (MRD) of the Alabama Department of Conservation and Natural Resources (www.state.al.us/mr/reef). The program encompasses approximately 1,200 square miles of offshore water included in the artificial reef general permit areas of Alabama.

In 1996, the Alabama MRD realized there was a need for artificial reefs within Alabama's inshore waters. The natural bottom offshore of Alabama is predominately flat sand bottom. It is well known that if vertical relief is created on this type of bottom, many reef fish such as snappers and groupers will be attracted and, over time, the artificial structure will appear as natural reef with similar communities of encrusting organisms and bait fish. Larger fish are attracted to these until a complete reef food web is created and the artificial reef functions as a natural reef.

The first two sites developed into inshore fishing reefs by the Division were at the derelict Fish River oyster reef and the old Shellbank oyster reef. Concrete bridge pilings and rubble were deployed in a roughly circular ring on the hard substrate of the historic reefs. These reef complexes in Mobile Bay and Mississippi Sound will be completed by placing oyster shell material inside the rings to promote the creation of a natural oyster reef community. In 1998, a similar reef was constructed on the western side of Mobile Bay on the remnants of Whitehouse oyster reef. Oyster cultch material was placed within the interior of this reef in August of 1998, completing the largest inshore artificial reef to-date in Alabama's inshore waters with an area of approximately 75 acres and a mile in circumference. A total of ten reefs will be constructed in this manner. Nine will be in Mobile Bay, and one will be built in the Mississippi Sound.

In summary, by creating a mosaic of EFH types—including hard substrate, salt marsh, shallow water, sand beach and SAV—plant, invertebrate, and fish production and utilization would likely be enhanced.

Constructed Wetlands for Stormwater Treatment

Compensation for unavoidable loss of palustrine forested or emergent wetlands is typically based upon the existing condition of the wetland in question and the functional attributes it provides. Wetland systems heavily affected by past activities would require minimal mitigation, while those of higher quality and in better condition would require more mitigation. Mitigation ratios are also quite variable and in part depend upon whether the subject system is isolated or contiguous. Contiguous systems are wetland systems that are hydrologically connected to waters of the U.S. (i.e., connected to streams, rivers or other drainageways). Typically, contiguous systems are considered more ecologically valuable and, as such, require more mitigation than isolated depressional wetlands. Acceptable mitigation for palustrine forested wetlands can include restoration of degraded habitat to freshwater wetland habitat of higher value, construction of wetlands and deepwater habitat for water storage and water quality treatment, and acquisition and preservation of environmentally sensitive lands threatened by development. The latter is usually an acceptable option when accompanied by some enhancement or restoration.

Since the proposed freshwater creation areas are associated with a stormwater treatment system they are not considered viable mitigation and, as such, are not likely to replace values lost while in association with the stormwater ponds. If not for the exclusion of constructed wetlands associated with stormwater facilities, it is likely that these areas would be consistent with policies and would provide adequate compensation for impacts to the low to moderate quality wetlands being affected. Emergent freshwater wetlands can be restored, enhanced, and created with a high likelihood of success.

5.2.2 Off-Site Mitigation

Seagrass Planting Program

Since 1967-68, over 50 percent of the SAV has disappeared from Mississippi Sound as a principal result of declining water quality and reductions in photo-synthetically active radiation (PAR) (Moncreiff et al., 1998). Only shoal grass exists in any type of measurable acreage in Mississippi Sound. In 1969, an estimated 5,252 ha of SAV were documented. Based on recent analysis, only 809 ha currently exist. This represents an 85 percent loss over 30 years and there is no indication that the existing beds are in a stable state. Water quality has not appreciably improved, so the probability of achieving high restoration success is quite low. Experimental studies underway by the GCRL would help determine whether physio-chemical conditions and adequate PAR is available to ensure plant maturation and growth (Moncreiff et al., 1998). A long-term monitoring of PAR levels at potential restoration sites would be beneficial in site selection. Should this study prove conditions would support SAV restoration, the proposed experimental and full-scale planting program for 10.4 acres would be viable mitigation.

Restoring seagrass beds, if successful, can be an appropriate mitigation strategy due to their high ecological value and declining abundance. Compared to tidal marshes (another important coastal nursery area for fish and invertebrates), seagrass beds are less abundant and have declined more dramatically. Seagrass restoration adds habitat value to unvegetated sand or mud substrate. The addition of seagrass beds increases the productivity and diversity of the unvegetated bottom, which can directly compensate for the loss in productivity and diversity due to the filling of Mississippi Sound water bottoms.

Fonseca et al. (1996a, 1996b) found that within two years, restored seagrass beds (*H. wrightii*) planted on 0.5-meter centers reach the same areal density and support animal densities, number of taxa, and species composition equivalent to natural beds. Some restored seagrass beds support invertebrate populations that are as or more abundant than those in natural grassbeds (Bell et al., 1993). Restored seagrass beds appear to be as suitable as natural seagrass beds for juvenile and small adult fish (Brown-Peterson et al., 1993).

Restored seagrass beds support animal densities similar to natural seagrass beds when shoot density is only one-third that of a natural seagrass bed (Fonseca et al., 1996). Thus, the habitat value of a restored seagrass bed is maximized relatively quickly, prior to the restored bed reaching the same vegetative density as a natural seagrass bed. In addition to providing habitat itself, seagrass beds increase the productivity of adjacent habitats. Irlandi and Crawford (1997) found that the presence of seagrass beds adjacent to tidal marshes increased the abundance and growth rates of fish in the tidal marsh.

Research has identified that seagrass beds are more diverse and productive than unvegetated substrate. Average fish densities in natural seagrass beds were ten times greater than on unvegetated areas (~20 ind./m^2 versus 1.74 ind./m^2). Shrimp densities in natural shoal grass beds averaged 151 ind./m^2 compared to 3.02 ind./m^2 in unvegetated areas. Crab densities in natural seagrass beds was 20-50 ind./m^2 compared to an average of 1.91 ind./m^2 on unvegetated areas (Fonseca et al., 1996). Within 1.5 years of planting, restored seagrass beds support shrimp, fish, and crab densities similar to natural seagrass beds (Fonseca et al., 1996). Thus, restored seagrass beds can increase the density of shrimp, fish, and crabs by 10 to 50 times compared to unvegetated substrate.

Although research has identified that seagrass beds are more diverse and productive than unvegetated substrate, relatively few studies compare secondary productivity between seagrass beds and other habitats. Heck et al. (1995) determined that eelgrass beds in the northeast had macroinvertebrate production 5 to 15 times higher than adjacent unvegetated habitats. At least a similar increase in productivity is expected for shoalgrass and turtlegrass, which have a higher primary productivity than eelgrass. Also, a similar increase in abundance, diversity, and productivity of fish species may also be expected.

Based on the scientific literature, the applicant proposed a compensation ratio of one-acre of seagrass as compensation for five acres of impacts to unvegetated substrate. This ratio acknowledges the increase in abundance, diversity, and productivity as a result of planting the seagrass, as well as the increase in abundance and diversity of adjacent habitats. This ratio is lower than the actual increases in density and productivity that would be anticipated based on the literature. However, without guaranteed success and with the known high mortality of seagrass plantings (Fonseca et al., 1998), the resource agencies' concern (NMFS, February 23, 1999) that this ratio is too high is valid, and a lower ratio may be more appropriate given their concerns. Should experimental seagrass restoration efforts prove that over 50 percent success can be achieved, then this ratio may indeed be too low.

Restoration of seagrass communities, while still considered by resource agencies to be experimental and not highly successful, can enhance habitat heterogeneity and the diversity of invertebrate and fish communities in Mississippi Sound, if carefully implemented. While seagrass restoration is an acceptable form of mitigation by the MDMR, none of the three commenting federal agencies are prepared to readily accept a form of mitigation that cannot be guaranteed. The recent treatise on seagrass restoration entitled " Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters" by Fonseca et al. (1998) discusses the benefits and risks associated with seagrass restoration. Given the documented success of more recent efforts to restore seagrass communities, restoration is rapidly becoming a proven resource management tool in some areas where conditions are appropriate.

To achieve success in restoring seagrass communities, the factors of proper site selection, selection of planting techniques, care in installation of planting units, and incorporation of plant demography into the planning process must be strongly understood and adhered to by resource mangers responsible for designing, funding, and construction. The lack of standard assessment techniques following planting has made evaluation of restoration success quite difficult (Race and Fonseca, 1996). However, seagrass plantings that persist over multiple years and generate the target acreage have been shown to quickly provide functional attributes associated with natural seagrass beds.

Given agency concerns for the lack of acceptable success guarantees, it may indeed be prudent to agree upon conditions that are acceptable to both state and federal agencies. While contributing funds for land acquisition with additional dollars should seagrass restoration not prove successful may be acceptable to the state, it is quite probable that federal resource agencies may not be satisfied with this alternative option since it is not clear that EFH habitat would benefit from some undefined future land acquisition. It may be prudent to seek clarification of the MDMR permit conditions and, possibly, to incorporate other mitigation treatments that would more clearly replace lost EFH values and have a high probability of success (i.e., tidal marsh creation, oyster reef construction, artificial reef deployment). Land acquisition through the Coastal Preserves Program, combined with habitat creation, restoration, or enhancement on the purchased property, may also be acceptable.

Deer Island Acquisition and Preservation

Given the location, high ecological value, size (400 acres), and its potential for preventing a large-scale development from proceeding, the Deer Island acquisition and deeding to the state represents a substantial form of mitigation. As part of the overall proposed Mitigation Plan, purchase and preservation of environmentally sensitive property complies with federal mitigation policies. Purchase alone would not meet some elements of federal mitigation policies, as habitat values affected are not being replaced to meet a no-net-loss policy. While not considered type-for-type mitigation, preservation of Deer Island would benefit aquatic resources in Mississippi Sound. The long-term ecological and water quality benefits attributable to preserving Deer Island for perpetuity is substantial.

With approximately 50 percent of the island composed of productive tidal marshes, mud flats, and tidal channels, preservation of the island would ensure that these resources continue to provide important functions and values to Mississippi Sound. If not acquired, development, such as the proposed Deer Island Resort, could result in negative impacts on aquatic and wildlife habitats, EFH and water quality effects. Water quality may decline in adjacent nearshore waters if Deer Island were to be developed. A decline in water quality would lead to reductions in fish diversity and abundance and benthic species diversity in the water column and bottom habitat, respectively. Neo-tropical migrants, which currently use the upland forests and transitional habitats, could also be affected by development. Preservation of the island would insure that these upland resources are protected.

There are a variety of other benefits of the proposed acquisition and protection of Deer Island. These benefits include the protection of ecologically valuable upland and wetland habitats, preventing impacts on coastal water quality, improving public access, and many others. Quantifying these benefits is not possible because they depend largely on many factors that are unknown at this time, especially how Deer Island would be managed in the future.

5.3 CONSISTENCY OF PROPOSED MITIGATION WITH FEDERAL MITIGATION POLICIES AND AGENCY COMMENTS

This section includes a review of applicable federal policies and guidance on mitigation, a review of agency comments received prior to preparation of this document, and an evaluation as to consistency of the proposed mitigation with agency policy.

5.3.1 Federal Mitigation Policies

A summary of mitigation programs and policies in effect by federal reviewing agencies, including the USEPA, USFWS, and NMFS, is provided below.

U.S. Environmental Protection Agency Mitigation Policy

Policies regarding mitigation under the Clean Water Act (CWA) Section 404(b)(1) guidelines were expressed in a Memorandum of Agreement (MOA) between the USEPA and the USACE and became effective February 7, 1990. The purpose of the MOA is to provide guidance to determine appropriate and practicable mitigation under the Section 404 Regulatory Program. Practicable is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes."

According to the MOA, on-site mitigation if preferable to off-site mitigation. Similarly, in-kind mitigation is preferable to out-of-kind mitigation. However, USEPA may accept off-site or out-of-kind mitigation if it is the most practicable solution. USEPA expressed a preference for restoration of wetlands over creation of wetlands from upland habitat for two reasons. First, USEPA considers the likelihood of success higher for restored wetlands than for created wetlands. Second, USEPA is concerned about the reduction of potentially valuable uplands resulting from the mitigation.

The MOA states that the objective of mitigation for unavoidable impacts is to offset environmental losses. Mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of wetland value), with an adequate margin of safety to reflect the expected degree of success, but this requirement may not be appropriate and practicable in all cases. A minimum of 1:1 acreage replacement may be used as a reasonable surrogate for no net loss of functions and values where definitive information is lacking. However, this ratio may be greater where the wetland being affected is high and the replacement wetlands are of lower functional value or the likelihood of success is low. Conversely, the ratio may be less than 1:1 for areas where the wetland being affected is low and the likelihood of success associated with the mitigation proposal is high.

U.S. Fish and Wildlife Service Mitigation Policy

The U.S. Fish and Wildlife Service Mitigation Policy (January 23, 1981) established policy for USFWS recommendations on mitigating the adverse impacts of land and water developments on fish, wildlife, and their habitats. According to the policy, compensation may be accepted for wetland impacts in a variety of ways. Mitigation activities may include: wildlife management activities, habitat construction activities, fishery propagation, protective designations on public lands, buffer zones, property leases, wildlife easements, water right acquisition, and fee title acquisition. Compensatory mitigation actions should only occur after all efforts to avoid and minimize impacts have been used. USFWS policy states that appropriate mitigation for unavoidable wetland impacts are based on the resource value of the potential affected wetland. Four categories of resource value have been defined by the USFWS for which different levels of mitigation may be determined.

A wetland classified as resource category 1 consists of high value wetland that is unique and irreplaceable on a national basis or in the eco-region. For this category, no loss of existing habitat value is the goal, and the USFWS will recommend that all losses of existing habitat be prevented.

A resource category 2 wetland is of high value and relatively scarce on a national basis or within the eco-region. For this category, the USFWS maintains a goal of no net loss of in-kind value. If unavoidable loss is likely to occur, in-kind replacement will be the recommendation. An exception to this rule may occur where the out-of-kind replacement is of greater value than the habitat to be affected, or in-kind replacement is not physically or biologically obtainable in the region.

A resource category 3 wetland is of high to medium value and is relatively abundant on a national basis. The USFWS mitigation goal is no net loss of habitat value while minimizing loss of in-kind habitat value. For impacts to resource category 3 wetlands, in-kind replacement is preferred. If in-kind replacement is not practicable, out-of-kind creation or restoration, or increased management of replacement habitat that increases the value of the existing habitat can achieve mitigation.

A resource category 4 wetland is of medium to low value, with a goal of minimum loss of habitat value. Compensatory mitigation for unavoidable losses to resource category 4 wetlands may be required; however, because they possess relatively low habitat value, mitigation should be minimal.

National Marine Fisheries Service

As described in the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), the Essential Fish Habitat (EFH) provisions of the act support one of the nation's overall marine resource management goals – maintaining sustainable fisheries.

The focus of the above mitigation policy is to conserve and enhance EFH and to avoid, minimize, or compensate for impacts to EFH due to development activities. As with the other federal agency policies, the primary goal of any action is to avoid impacts to natural resources. However, if impacts to these resources are unavoidable, compensatory mitigation may be required. When unavoidable impacts to EFH occur, the NMFS will recommend mitigation measures to compensate for any loss of resource value. Recommendations may include: restoration of riparian and shallow coastal areas (i.e., reestablishment of vegetation, restoration of hardbottom characteristics, removal of unsuitable material, and replacement of suitable substrate), upland habitat restoration, water quality improvement or protection, watershed planning, and habitat creation. The preferred type of mitigation is enhancement of existing habitat, followed by restoration and, finally, creation of new habitat.

Mitigation should focus on the replacement of lost habitat and associated values attributed to the habitat and toward maintaining sustainable fisheries. In particular, mitigation should be targeted to those species of finfish and shellfish listed (see Section 3.0). General conservation guidelines developed by NMFS as a means to minimize or mitigate EFH impacts are defined in Section 7.2 of the Generic Amendment for Addressing Essential Fish Habitat Requirements in Fishery Management Plans of the Gulf of Mexico (GMFMC, 1998). While specific conservation guidelines will be provided by NMFS within 30 days of initiation of formal consultation, the following general recommendations, taken from the above-cited amendment, applicable to this project are summarized below.

<u>Docks and Piers</u>

a) Docks and piers should be aligned to avoid existing oyster reefs, marsh grasses, and seagrass beds when possible. In addition, pier walkways should generally be no wider than four feet.
b) Terminal structures should be located in sufficiently deep waters to avoid propwashing of bay bottoms.
c) In non-vegetated areas shallower than 4 feet at mean high water (MHW), terminal structures should be limited to a maximum width of 8 feet and length of 20 feet. In non-vegetated waters deeper than –4 feet MHW, terminal structures should be limited to a maximum width of 10 feet and length of 30 feet.
d) Deck board spacing should be at least one inch to allow sunlight penetration to the water.
e) Piers should not be constructed within 50 feet of an existing oyster reef. Oyster reefs should be temporarily marked to help avoid impacts during construction.
f) Support structures in contact with the water should be constructed of non-toxic material.

<u>Marinas</u>

a) Marinas are best created from excavated uplands that are designed so that water quality degradation does not occur. Applicants should consider basin flushing characteristics and other design features such as surface and wastewater collection and treatment facilities. Catchment basins for collecting and storing runoff should be included as components of the site development plan.
b) Marinas should be located in areas where suitable physical conditions exist. For example, potential sites should be located in areas with suitable navigable depths to avoid dredging or propwashing and away from environmentally sensitive areas such as wetlands, seagrasses, shellfish beds, mud flats, and sandy beach areas.

c) To protect water quality and to provide adequate flushing, turning basins and access channels should not create sumps or other slack-water areas and depths must not exceed those of the connecting waterbody.
d) Consideration should be given to aligning access channels and configuring marinas to take full advantage of circulation from prevailing winds, with emphasis on the hottest months of the year.
e) Permanent dredged material disposal sites (for use in initial and maintenance dredging) that do not affect wetland areas should be acquired. Projects that lack permanent disposal sites will likely not be authorized if maintenance dredging is needed and disposal sites/options are not available.
f) Catchment basins for collecting and storing surface runoff should be included as components of the site development plan.
g) Marinas should be sited in areas with adequate upland area to provide parking and other support facilities.
h) Marinas with fueling facilities should be designed to include measures for reducing oil and gas spillage into the aquatic environment.
i) Facilities for the collection of trash are required. Where vessels with marine toilets will be moored, pump-out facilities and notices regarding prohibition of sewage and other discharges are required.

<u>Bulkheads and Seawalls</u>

a) Vegetation plantings, sloping (3:1) riprap or gabions are generally considered to be environmentally compatible as shoreline stabilization methods over vertical seawalls since they provide shoreline protection and also provide good quality fish and wildlife habitat. Riprap material should be clean and free of toxic substances.
b) Vertical structures should be constructed so that reflective wave energy does not scour or otherwise adversely affect adjacent essential fish habitat or adjacent shorelines.
c) Submerged riprap material should be placed at the toe of bulkheads to protect the integrity of the bulkhead, reduce reflective wave energy, and provide hard substrate for aquatic organisms.
d) Breakwaters should have openings that allow for fish ingress and egress and water circulation.
e) Breakwaters constructed of riprap material with a minimum 3:1 slope are preferred in most cases in lieu of vertical wall structures.

<u>Navigation Channels and Boat Access Canals</u>

a) Alignments of channels and access canals should use existing channels, canals, and other deep-water areas to minimize initial and maintenance dredging requirements.
b) Alignments should avoid sensitive habitats such as oyster reefs and areas of submerged or emergent vegetation. In addition, canals and channels should not cut through barrier beaches, barrier islands, or other Gulf shoreline protection features.
c) Access channels and canals should be designed to ensure adequate flushing so as not to create low-dissolved oxygen conditions or sumps for heavy metals and other contaminants. Widths

of access channels in open water should be minimized to avoid impacts to aquatic bottoms. Dredge depths should be no greater than necessary for navigation but should not exceed –6 feet MLW unless it can be clearly demonstrated that deeper draft vessels would be using the channel or canal.

d) Permanent dredged material disposal sites should be located in upland areas.
e) Construction techniques (e.g., silt curtains) must minimize turbidity and dispersal of dredged materials into sensitive wetland areas (i.e., submerged grasses and shellfish beds).
f) Channels and access canals should not be constructed in areas known to have high sediment contamination levels. To the maximum extent possible, the timing of navigation channel maintenance should be confined to seasons when impact on larval and juvenile fishes will be minimal. This period of time will vary among geographical areas and based on species life histories.

5.3.2 Agency Comments

Comment letters were received from the USEPA, USFWS, and NMFS in response to the submittal of the Joint Permit Application (Baker, 1998) and supplemental materials (Baker, 1999). A synopsis of items found within these letters relative to mitigation is provided below. Note that at the time of these comments, the Deer Island component of the Mitigation Plan had not been fully established.

<u>United States Environmental Protection Agency</u>

March 30, 1999 Letter to USACE:

- Disagree as to acreage of impacts to estuarine water bottoms. Applicant proposes mitigation for loss of 63.1 acres of wetlands and estuarine bay bottoms, while USEPA cited waterside impacts to over 100 acres of shallow bay bottoms.

- On-site mitigation as proposed in application is insufficient compensation for functional losses associated with the filling of water bottoms and non-tidal wetlands. Wetland systems designed for treatment use do not become jurisdictional waters of the U.S.; therefore, treatment wetlands cannot be credited as compensatory mitigation for impacts to waters of the U.S.

- Unclear to USEPA how the filling of water bottoms to construct jetties will mitigate for itself by the creation of habitat that is not native to Mississippi Sound.

- Applicant proposes to mitigate for balance of project impacts (51.8 acres based on assumption of 63.1 acres of total impact) by restoring 10.4 acres of seagrass beds at an unspecified location. Applicant does not guarantee success of restoration effort. USEPA believes that given high rate of failure in similar attempts, it is likely that no effective mitigation will be offered by this component.

- USEPA agrees that preservation of Deer Island would be a valuable addition to the Mississippi Sound Coastal Preserves Program; however, it does not eliminate concerns raised regarding impacts of project and need for EIS.

United States Fish and Wildlife Service

February 25, 1999 Letter to USACE:

- Disagree as to acreage of impacts to wetlands and estuarine water bottoms. Applicant proposes mitigation for loss of 63.1 acres of wetlands and estuarine bay bottoms, while USFWS calculated 133.5 acres of water bottoms and wetland fill and shading.

- Restoration of marina as proposed does not constitute appropriate mitigation. Existing marina basin provides some seasonal fishery habitat. Partial credit would require clear case to support increase in productivity by Proposed Action. Such documentation has not been provided.

- Applicant proposes to obtain 2.2 acres of mitigation credit for creating interstitial habitat as a result of filling 12 acres for breakwater. The USFWS will not allow credit for possible habitat benefits associated with adding breakwaters and jetties to a sand-mud bottom. Construction of jetties breakwaters has never been authorized as appropriate mitigation for the filling of Mississippi Sound bottoms and would create habitat that is not native to the Sound. Therefore, they cannot count toward mitigation.

- The proposed beach would provide little habitat benefits, and placement of the proposed tidal marsh between two jetty walls would greatly diminish any gains provided by proposed marsh.

- Applicant has proposed to restore 10.4 acres of seagrass as mitigation for balance of impacts to Mississippi Sound water bottoms. Ratio proposed is 1:5 (i.e., one acre of restoration for five acres of impact). The reason given for low ratio is the difficulty in achieving successful restoration. Applicant does not guarantee success in seagrass restoration effort. USFWS does not accept mitigation without performance guarantees and alternative solutions in case of failure. Due to low rate of success demonstrated elsewhere and unknown reasons for seagrass declines along the Mississippi coast, the agency believes this effort has a high probability of failure.

- The USFWS objects to proposed Mitigation Plan; however, the agency understands additional mitigation is forthcoming that may address its concerns and, as such, reserves its right to provide additional comments concerning proposed mitigation.

National Marine Fisheries Service

February 23, 1999 Letter to USACE:

- NMFS believes the project will adversely affect Essential Fish Habitat and federally managed and associated fishery resources. An EFH assessment is necessary and consultation may be required.

- There have been no discussions with NMFS toward establishing appropriate mitigation and the agency does not agree with the 1:5 ratio being proposed. Addendum also did not address the need to mitigate for dredging impacts associated with deepening shallow water habitat.

- The mitigation offered does not assure that ARNI and the EFH concerns can be adequately compensated. NMFS cannot support the 10-acre seagrass restoration demonstration project as the fundamental component for estuarine impacts. NMFS stated that seagrass restoration is difficult and the site conditions and other factors must be considered in light of the research that has been performed in Mississippi Sound. The agency acknowledges and suggests use of seagrass restoration guidelines developed by Fonseca et. al. (1998) and indicates its availability to work with the applicant and to review any specific plan when developed.

5.3.3 Consistency of Proposed Mitigation Measures with Agency Policies and Comments

5.3.3.1 Non-Tidal Wetland Creation

While creating freshwater marshes can compensate for the loss of low to moderate quality wetlands, if constructed and maintained as part of a stormwater management system, they can not be credited as mitigation. Based on the USEPA's comments, these wetlands would not be considered jurisdictional wetlands as they would be severed from waters of the United States; therefore, considering this measure as mitigation would not be consistent with USEPA policies. USEPA policy also states that mitigation for isolated wetlands of low to moderate value may be less than 1:1 where the likelihood of success associated with the proposed mitigation is high. It appears that the mitigation proposed to compensate for the loss would meet USEPA policy if not constructed as part of a proposed stormwater management system.

The two isolated wetlands proposed to be affected may be considered category 4 wetlands by the USFWS as they are both low in terms of functional value. This is supported by the WRAP assessment performed (Section 3.4), where the WRAP baseline scores assigned to the affected wetlands were 0.31 and 0.46 for Wetland No. 1 and No. 3, respectively (Section 3.4). The presence of a mature canopy within the wetlands generally improves the wetland values; however, the lack of evidence of wildlife use, lack of buffer, and apparent seasonally saturated hydroperiod generally results in lower wetland values. The raw debit (WRAP baselines values x area) for both wetlands is 1.44. A comparison of the debit and credit scores (Section 3.4) shows that, based on this functional assessment, the created wetland comes close to but does not totally replace the values lost for Wetland No.1 and No. 3 (Section 3.4). According to USFWS policy, resource category 4 impacts should achieve a minimum loss of habitat value. Compensation may be required but can be minimal as long as the values are replaced. Constructing wetlands that provide replacement of values according to a functional assessment meets the requirements of the USFWS mitigation policy. Use of WRAP as an assessment technique was accepted by the federal review agencies present at the PDEIS review meeting held on March 1,2, 2000.

5.3.3.2 On-Site Shallow Water Habitat Restoration and Creation

All on-site measures proposed in the Mitigation Plan as compensation for EFH impacts are in accordance with the NMFS general mitigation and habitat conservation policies because they serve to enhance fisheries resources occurring in this area of Mississippi Sound. On-site shallow water habitat measures—including creation of saltmarsh, intertidal beach, and hard substrates—are all measures that would be consistent with NMFS policies if constructed in accordance with habitat conservation guidelines specified in EFH guidance materials (GFMC, 1998). However, since the latter two measures involve conversion of new shallow water soft bottom habitat to create these habitats, functional gains are not considered by NMFS to be as significant as they might otherwise be. These measures are consistent with policy and do not differ from the incidental conversion of soft bottom habitat to some other habitat that enhances fisheries resources, such as artificial reef placed in shallow waters throughout the Gulf of Mexico. Inshore artificial reefs made of rock and rubble have been constructed over soft-bottom habitat throughout Mississippi Sound and in Mobile Bay (www2.datasync.com/dmr/fisheries, www.dcnr.al.us/mar). Mitigation for the loss of soft bottom communities and associated water column displacement have not (to the knowledge of the applicant) required a reduction in value or benefits attributable to the proposed habitat conversion (e.g., placement of artificial structures in Mississippi Sound). It is essential that the agencies implementing these measures consider some artificial structures or habitat conversion advantageous to sustaining fisheries resources over and above the values attributed to non-vegetated soft bottom habitat.

Creation of seagrass on-site, while desirable ecologically, is not supported by the NMFS as a viable mitigation measure due to its low probability of success. If successful, however, this measure would be consistent with the conservation goals and objectives of the Manguson Stevenson Act and EFH guidelines. If designed and constructed in accordance with the conservation guidelines, breakwater construction could also be consistent with this portion of the policy directive. While soft-bottom unvegetated habitat is being converted to a resource not considered native to Mississippi Sound, a portion of the breakwater structure would enhance fisheries resources and, thus, would be consistent with policy guidance. If constructed in accordance with the general habitat conservation guidelines, this feature would be consistent with policy and the guidelines summarized above.

5.3.3.3 Off-Site Seagrass Restoration and Deer Island Acquisition and Preservation

As discussed previously in this chapter, seagrass restoration would be acceptable to the agency and meet policy-driven guidelines if the likelihood of success was high. Based on the agency comments received from the USEPA, USFWS and NMFS, none of the agencies believe this measure is viable mitigation since the success can not be assured. All agency policies on mitigation allow for selection of measures that have a high likelihood of success. If studies had already been completed to show that the decline in seagrass beds has ceased, that water quality and clarity (PAR) has improved to support seagrass, and that planting methods and success criteria were further refined, it is quite likely that the resource agencies would consider this measure as acceptable mitigation and consistent with their mitigation policies.

Acquisition and preservation of Deer Island as a mitigation measure for compensation for the loss of EFH impacts from dredge and fill activities in Mississippi Sound would be consistent with existing policy and guidelines if it can be shown that this measure would provide ecological benefits to target fisheries in Mississippi Sound and that it serves to enhance fisheries resources. While acquisition is not the preferred mitigation method encouraged by the NMFS, it nonetheless would provide such benefits and could be further strengthened if combined with other more direct enhancement or creation measures, such as saltmarsh creation. Benefits attributable to this acquisition are described in Section 5.2.

5.4 ALTERNATIVE MEASURES

The following measures are accepted mitigation treatments that can compensate for EFH impacts. These treatments are suggested as potential alternatives should the agencies, during coordination meetings, wish to evaluate other options. It is assumed that conversion of a soft-bottom habitat to a higher resource type such as saltmarsh or nearshore artificial reefs to support oysters, other shellfish and targeted finfish would not be diminished due to the value of the soft-bottom habitat being converted. Since artificial reefs are deployed throughout Mississippi Sound and in other Gulf waters for enhancing fish production without consideration for impacts to soft-bottom resources and fisheries impacts, these alternative measures should be evaluated in a similar light.

Tidal Marsh Creation on Deer Island or Other Upland Sites

The Grand Bayou estuarine system on Deer Island could be expanded by converting pine forest and upland shrub community to low and high tidal marshes. Actual locations would be sited in consultation with the MDNR, USFWS, and NMFS. Marsh creation has proven highly successful along the Gulf and Atlantic states in compensating for the loss of EFH (Broome, 1990). Tidal marshes could be designed and constructed to match elevations and vegetative conditions of the adjacent marshes on the island. Other upland sites suitable for saltmarsh creation would also provide similar benefits; however, their availability is unknown.

The creation of saltmarshes from upland habitat has proven quite successful and can generally meet assigned success criteria within three years of construction if designed and constructed properly (USACE, 1996). Ecological benefits attributable to saltmarshes are considerable and have been extensively studied by numerous authors (Section 5.2). Monitoring efforts in Florida showed that of all coastal mitigative measures assessed, saltmarsh creation had the highest degree of success in meeting defined success criteria (USFWS, 1984).

Artificial Reef Module Design and Deployment

While construction of shallow inshore artificial reefs has proven successful off the Alabama coast in providing needed substrate to enhance finfish production, only recently has any interest been shown in enhancement of inshore fisheries through use of artificial reefs. The MDMR manages the state's artificial reef program. In nearshore environments, similar to the Broadwater location, hard substrate has been used to increase fish production and diversity. Over 16 inshore reefs have been built along the Mississippi Sound shore, including one off the north side of Deer Island. In offshore waters of Mississippi Sound, 226 fish havens have been created. While these were not constructed to offset impacts to EFH, their success in enhancing fish production and diversity is well known (D'Itri, 1985). Reef types vary based on the depth of deployment, targeted resources, and the overall purpose of deployment. In general, Alabama has significantly enhanced its fisheries resources both inshore and offshore through an aggressive artificial reef program.

As compensation for EFH impacts, inshore fish havens could be established. This could include the design, construction, deployment, and monitoring of reef modules located in Mississippi Sound off Deer Island. Modules could be designed to target specific EFH species and fabricated and placed in nearshore Gulf waters.

Oyster Bed Creation and Seeding

Building new oyster reefs or seeding/restoring old ones has been successful throughout the Gulf states, especially in areas where oysters are harvested commercially. Based on discussions with the USACE regulatory office in Mobile, this approach is quite common and most states receive funding from both state and federal programs. In addition, this measure has been used to mitigate EFH impacts for other projects, where funds were provided to the state for oyster reef construction. Commercial oyster beds occur in the western coastal area near Pascagoula. No oyster beds open to commercial harvest occur in the Biloxi region; however, the construction of beds is ecologically valuable and need not occur only where water quality can support commercial beds. Oyster reefs provide a wealth of ecological benefits to fisheries and can play an important role in sustainability of nearshore fisheries.

The oldest and most common substrate modification programs in Atlantic and Gulf coast estuaries have involved the creation of habitat to support the settlement and recruitment of oyster spat, commonly referred to as oyster reefs. The USACE has built oyster reefs in both Galveston and Chesapeake Bays by using dredged material to raise the elevation of the bay and then covering the area with suitable sized gravel or cultch (old oyster shells) (USACE, 1996). Similar seafloor modifications have been employed in Grays Harbor, Washington to provide habitat for Dungeness crabs (USACE, 1996).

Siting, design, and construction of oyster reefs using dredged material from the proposed project is an option worth further investigation; however, its feasibility is currently unknown.